1. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{12x^3 + 39x^2 - 30}{x + 3}$$

A. $a \in [-38, -33], b \in [147, 149], c \in [-441, -436],$ and $r \in [1291, 1296]$.

B. $a \in [11, 13], b \in [75, 77], c \in [220, 232],$ and $r \in [644, 646]$.

C. $a \in [11, 13], b \in [-3, 5], c \in [-12, -2],$ and $r \in [-7, 2]$.

D. $a \in [-38, -33], b \in [-70, -65], c \in [-207, -199],$ and $r \in [-654, -650]$.

E. $a \in [11, 13], b \in [-14, -8], c \in [29, 38],$ and $r \in [-181, -171]$.

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2. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 15x^3 - 44x^2 - 79x + 60$$

A. $z_1 \in [-5, -2],\ z_2 \in [-0.9, -0.2],$ and $z_3 \in [0.92, 1.85]$

B. $z_1 \in [-5, -2],\ z_2 \in [-2.2, -0.9],$ and $z_3 \in [0.42, 0.84]$

C. $z_1 \in [-0.6, 0.4],\ z_2 \in [1.1, 2.8],$ and $z_3 \in [3.7, 4.42]$

D. $z_1 \in [-1.67, -0.67],\ z_2 \in [-0.3, 0.8],$ and $z_3 \in [3.7, 4.42]$

E. $z_1 \in [-5, -2],\ z_2 \in [-3.3, -2.1],$ and $z_3 \in [-0.02, 0.34]$

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3. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 10x^3 + 3x^2 - 79x - 60$$

A. $z_1 \in [-3.1, -2.7],\ z_2 \in [0, 0.71],$ and $z_3 \in [4.9, 5.12]$

B. $z_1 \in [-3.1, -2.7],\ z_2 \in [0, 0.71],$ and $z_3 \in [1.12, 1.66]$

C. $z_1 \in [-2.8, -1.6],\ z_2 \in [-0.89, -0.5],$ and $z_3 \in [2.53, 3.23]$

D. $z_1 \in [-3.1, -2.7]$, $z_2 \in [0.74, 1.16]$, and $z_3 \in [2.35, 2.78]$

E. $z_1 \in [-1.5, -0.9]$, $z_2 \in [-0.58, -0.22]$, and $z_3 \in [2.53, 3.23]$

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4. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{4x^3 - 75x - 129}{x - 5}$$

A. $a \in [2, 7], b \in [12, 18], c \in [-14, -6]$, and $r \in [-181, -171]$.

B. $a \in [2, 7], b \in [-26, -14], c \in [21, 26]$, and $r \in [-257, -246]$.

C. $a \in [17, 22], b \in [-103, -96], c \in [424, 427]$, and $r \in [-2255, -2252]$.

D. $a \in [17, 22], b \in [96, 105], c \in [424, 427]$, and $r \in [1992, 1999]$.

E. $a \in [2, 7], b \in [17, 23], c \in [21, 26]$, and $r \in [-7, -3]$.

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5. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{20x^3 + 55x^2 - 30x - 43}{x + 3}$$

A. $a \in [-62, -56]$, $b \in [-130, -124]$, $c \in [-406, -400]$, and $r \in [-1263, -1256]$.

B. $a \in [19, 26]$, $b \in [111, 121]$, $c \in [310, 319]$, and $r \in [898, 908]$.

C. $a \in [-62, -56]$, $b \in [231, 237]$, $c \in [-735, -733]$, and $r \in [2160, 2164]$.

D. $a \in [19, 26]$, $b \in [-26, -22]$, $c \in [66, 73]$, and $r \in [-327, -319]$.

E. $a \in [19, 26]$, $b \in [-6, -1]$, $c \in [-18, -14]$, and $r \in [1, 8]$.

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6. Factor the polynomial below completely, knowing that $x - 5$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 10x^4 - 113x^3 + 434x^2 - 655x + 300$$

A. $z_1 \in [-1.5, 0.7]$, $z_2 \in [0.88, 2.15], z_3 \in [2.83, 3.07]$, and $z_4 \in [4.76, 5.22]$

B. $z_1 \in [-6.1, -4.5]$, $z_2 \in [-3.06, -1.3], z_3 \in [-1.58, -0.95]$, and $z_4 \in [-0.43, -0.37]$

C. $z_1 \in [0.5, 0.9]$, $z_2 \in [2.3, 2.76], z_3 \in [2.83, 3.07]$, and $z_4 \in [4.76, 5.22]$

D. $z_1 \in [-6.1, -4.5]$, $z_2 \in [-3.06, -1.3], z_3 \in [-2.56, -2.44]$, and $z_4 \in [-0.91, -0.66]$

E. $z_1 \in [-6.1, -4.5]$, $z_2 \in [-4.78, -3.6], z_3 \in [-3.23, -2.63]$, and $z_4 \in [-0.61, -0.48]$

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7. Factor the polynomial below completely, knowing that $x-2$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 12x^4 - 83x^3 + 197x^2 - 188x + 60$$

A. $z_1 \in [-3.21, -2.92]$, $z_2 \in [-2.11, -1.9], z_3 \in [-1.87, -1.4]$, and $z_4 \in [-0.97, -0.76]$

B. $z_1 \in [-3.21, -2.92]$, $z_2 \in [-2.11, -1.9], z_3 \in [-2.06, -1.61]$, and $z_4 \in [-0.48, -0.26]$

C. $z_1 \in [0.79, 1.04]$, $z_2 \in [1.45, 1.69], z_3 \in [1.79, 2.39]$, and $z_4 \in [2.98, 3.13]$

D. $z_1 \in [-3.21, -2.92]$, $z_2 \in [-2.11, -1.9], z_3 \in [-1.42, -1.16]$, and $z_4 \in [-0.73, -0.63]$

E. $z_1 \in [0.42, 0.78]$, $z_2 \in [0.65, 1.49], z_3 \in [1.79, 2.39]$, and $z_4 \in [2.98, 3.13]$

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8. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{10x^3 - 46x^2 + 40x + 22}{x - 3}$$

A. $a \in [29, 35]$, $b \in [41, 48]$, $c \in [169, 174]$, and $r \in [534, 540]$.

B. $a \in [10, 11]$, $b \in [-18, -9]$, $c \in [-8, -7]$, and $r \in [-5, 2]$.

C. $a \in [10, 11], \ b \in [-76, -75], \ c \in [265, 271], \text{ and } r \in [-787, -778].$

D. $a \in [29, 35], \ b \in [-137, -132], \ c \in [448, 452], \text{ and } r \in [-1326, -1315].$

E. $a \in [10, 11], \ b \in [-30, -22], \ c \in [-12, -9], \text{ and } r \in [-5, 2].$

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9. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 6x^2 + 7x + 7$$

A. $\pm 1, \pm 2, \pm 3, \pm 6$

B. $\pm 1, \pm 7$

C. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 7}$

D. All combinations of: $\dfrac{\pm 1, \pm 7}{\pm 1, \pm 2, \pm 3, \pm 6}$

E. There is no formula or theorem that tells us all possible Integer roots.

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10. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 6x^2 + 6x + 4$$

A. $\pm 1, \pm 2, \pm 4$

B. $\pm 1, \pm 2, \pm 3, \pm 6$

C. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 2, \pm 4}$

D. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 2, \pm 3, \pm 6}$

E. There is no formula or theorem that tells us all possible Integer roots.
